76021

CRUISE REPORT

MASSACHUSETTS COOPERATIVE

UNIBOOM SEISMIC

EASTERN RHODE ISLAND SOUND

NORTHEAST VINEYARD SOUND

AND

WESTERN NANTUCKET SOUND

RESEARCH VESSEL - ASTERIAS

CRUISE A-6-76

JUNE 21-JUNE 30, 1976

U.S. GEOLOGICAL SURVEY
OFFICE OF MARINE GEOLOGY
WOODS HOLE, MASSACHUSETTS
02543

C.J. O'HARA

INTRODUCTION

A high-resolution subbottom seismic profiling survey was conducted in Massachusetts coastal waters south of Cape Cod - Vineyard Sound and Nantucket Sound - by the U.S. Geological Survey from June 21st through June 30th, 1976. The offshore investigation is part of a continuing marine geologic program, funded jointly by the Department of Public Works of the Commonwealth of Massachusetts and the U.S. Geological Survey, Office of Marine Geology, Woods Hole. In addition, at the request of the New England Division of the U.S. Army Corps of Engineers, a Uniboom seismic site survey was conducted in Eastern Rhode Island Sound over the proposed Browns Ledge Dredge Spoil Dump Site and contiguous areas. The surveys were carried out aboard the WHOI research vessel Asterias under Captain Dick Colburn. Ports of operation, in addition to Woods Hole, included Cuttyhunk Island and Nantucket Island.

OBJECTIVES

Mass. Co-op.

The cooperative marine program is designed to provide the Commonwealth of Masschusetts a detailed accounting and geological eveluation of the lands that lie submerged beneath its coastal waters. Principle objectives include detailed mapping of geological features, assessment of potential mineral resources, feasibility and environmental impact studies related to offshore mining of sand and gravel, and environmental considerations relative to offshore disposal of solid waste material.

The geophysical investigations provide a working base for planned programs of vibracoring and bottom sampling of shallow subsurface and bottom geological features. Laboratory analysis of the vibracore and bottom grab samples will establish important baseline data, evaluate the economic significance of the subsea deposits and, coupled with geophysical data, provide information on the geology and geologic history of the region.

Browns Ledge Dredge Dump Site Survey

As aprt of the proposed Federal Harbor improvement and maintenance dredging of Fall River and Mt. Hope Bay under the jurisdiction of the U.S. Army Corps of Engineers, the disposal of the resultant dredge spoil is planned for an ocean dump site located 2 miles southeast of Browns Ledge in Eastern Rhode Island Sound. In addition, the proposed site is also being considered as a "regional" disposal grounds to be utilized by state and private organizations performing dredging work authorized by the Corps.

The U.S.G.S. at the request of the Army Corps conducted a Uniboom seismic site survey of the proposed disposal area and contiguous land to provide more detailed information on the geology of the bottom and shallow subbottom. The site survey covered a 55 sq kilometer area at a track line spacing of 0.7 nautical miles. Only the higher frequency returns (900 Hz - 6KHz range) were recorded for best resolution of acoustic units within the upper few tens of meter below the bottom. This data, coupled with information already obtained from the regional investigation, will provide additional insight into the suitability of the area as a dredge spoil disposal grounds.

Personnel

The following U.S.G.S. personnel participated over the course of the survey.

Charles J. O'Hara	Scientist - in - charge
Robert N. Oldale	Geologist
Dick Sylwester	Electronic Technician
Wayne Ferrebee	Geologist
Patricia Forrestel	Physical Science Technician
Ken Parolski	Electronic Technician

Shipboard Systems

The following systems were an operation during the survey:

EG & G Uniboom Catamaran with mounted tranducer

EG & G Capacitor Bank

EG & G and Geodyne Hydrophone Streamers (10 element)

EPC Seismic Recorder (#154)

Seismic Amplifier (USGS model)

Krohn - Hite Bank Pass Filter

Epsco LORAN - C Receiver

Epsco LORAN - C Repeater

OPERATIONAL PROCEDURES

All seismic track lines were pre-plotted along LORAN - C navigation lines of position. This approach facilitates control of the survey vessel on the seismic tracks despite the course setting influence of wind and currents. Cape Race, Newfoundland and Dana, Indiana LORAN - C slave transmitters were utilized as they are the most reliable and provide the best positional accuracy within the area. Positional data was logged at 15 minute intervals.

The hydrophone array and catamaran float with mounted transducer were towed abeam of each other about 15 meters astern of the survey vessel. This configuration, coupled with ship's speed over the bottom of about 4.8 knots, resulted in a sound source/receiver separation of approximately 10 meters. The transducer was triggered every 0.5 second and the sweep rate of the recorder was set at 0.25 second. Only incoming seismic signals within the 400 Hz - 4 KHz frequency range were fed to the recorder except as noted for the Browns Ledge Site survey.

In Vineyard Sound and Nantucket Sound, 19 traverses were made in a NW-SE orientation with a line spacing of 1 nautical mile and 3 traverses were made in a SW-NE orientation with a line spacing of 4 nautical miles.

Despite less than optimum sea state conditions and the multiple problem associated with shallow water and extensive shoaling, subbottom penetration of up to 125 MSEC - two way travel - was achieved.

Statistics

Scheduled ship time - 10 days

Working at sea - 9 days

Down time

Inclement weater - 1 day

Equipment malfunction - 1 day

Actual survey time at sea - 8 days

Ship tracks - continuous Uniboom seismic

Eastern Rhode Island Sound - 52 nm (95 km)

Vineyard Sound - 20 nm (37 km)

Nantucket Sound - 230 nm (426 km)

TOTAL - 302 nm (560 km)

Final completion of the Uniboom investigation of Nantucket Sound is slated for October, 1976.

Narrative

June 21 -

0715 - commence loading shipboard systems

1100 - depart Woods Hole, commence seismic profiling western Nantucket Sound

1530 - end profiling, EPC recorder malfunctioning

1715 - arrive WH, EPC repaired

June 22 -

0730 - depart WH

0923 - resume seismic profiling Nantucket Sound

1715 - end profiling, LORAN - C navigation out

1835 - arrive WH, LORAN - C receiver repaired

June 23 -

0730 - depart WH

0855 - resume seismic profiling Nantucket Sound

1830 - end profiling

2055 - arrive WH

June 24 -

0730 - depart WH

0841 - resume seismic profiling Nantucket Sound

1735 - end profiling

2100 - arrive WH

June 25 -

No go inclement weather

Seismic recorder sent to EPC labs, N.H. - vibration problems with stylus belt, repaird and returned

June 26 -

0730 - depart WH, on route Eastern Rhode Island Sound

1104 - commence Uniboom seismic site survey of Browns Ledge disposal area

1928 - end profiling, site survey incomplete

2045 - arrive Cuttyhunk Harbor for the night

June 27 -

0530 - depart Cuttyhunk Harbor

0649 - resume Browns Ledge site survey

1038 - site survey completed, on route Vineyard Sound

1329 - commence seismic profiling NE Vineyard Sound

1815 - end profiling, seismic system down, lost signal input to recorder

1910 - arrive WH

June 28 -

0730 - depart WH, checkout and repair of seismic system, hydrophone and amplifier both out.

1248 - resume profiling Nantucket Sound, new hydrophone and seismic amplifier

1850 - end profiling

2100 - arrive Nantucket Harbor for the night

June 29 -

0500 - depart Nantucket Harbor

0600 - resume profiling Nantucket Sound

1730 - end profiling

1815 - arrive Nantucket Harbor for the night

June 30 -

0530 - depart Nantucket Harbor

0553 - resume profiling Nantucket Sound

1337 - end profiling - Nantucket Sound survey 40% complete

1536 - arrive WH, unload gear, end of survey

Note: all times given in Eastern Daylight Savings

Figure 1 shows areas of investigation and seismic coverage.

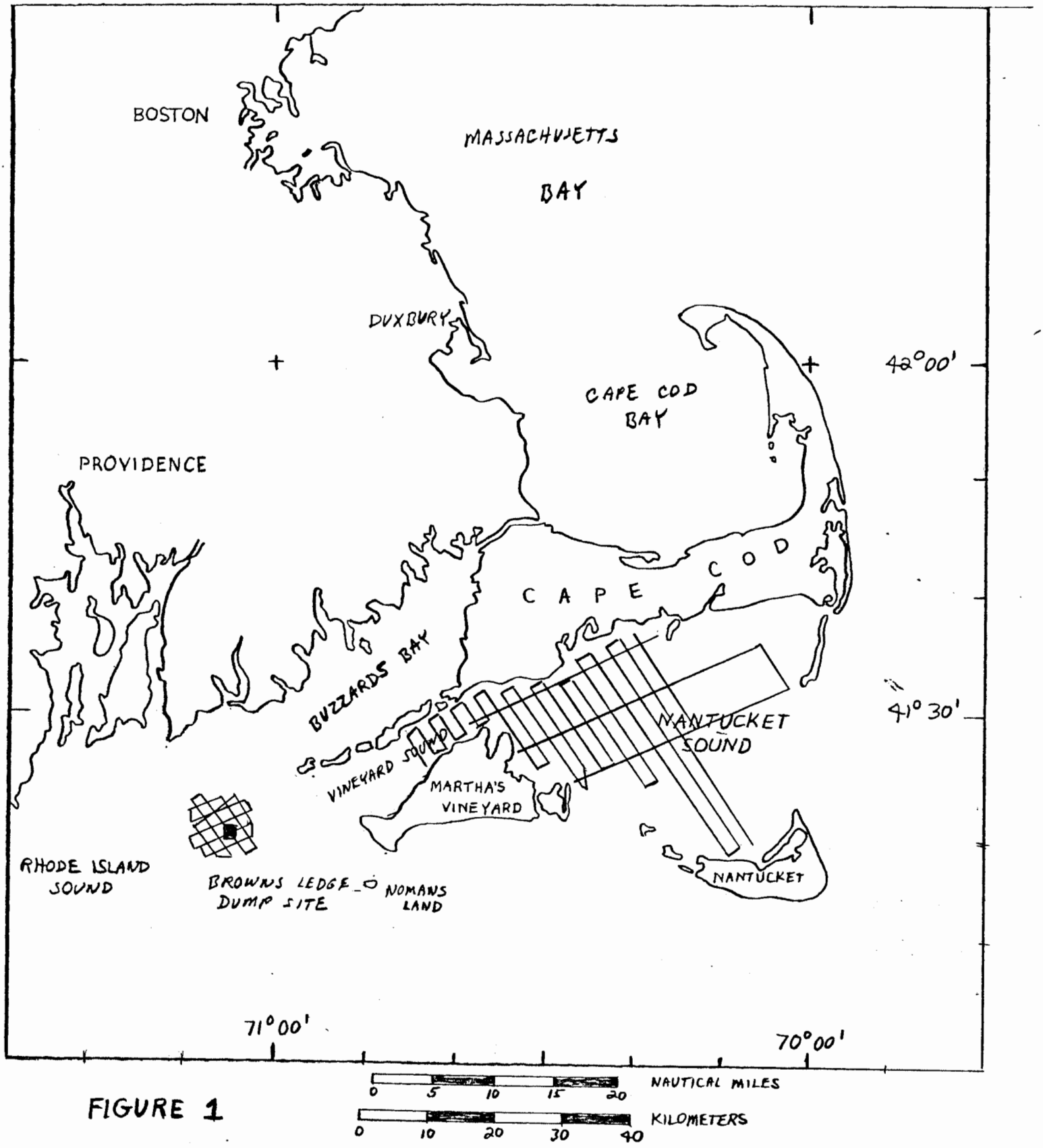
BOSTON
MASSACHUSETTS
BAY
DUXBURY
CAPE COD
BAY
42°00'
PROVIDENCE
CAPE COD
BUZZARDS BAY
41° 30'
NANTUCKET
SOUND
VINEYARD SOUND
MARTHA'S
VINEYARD
RHODE ISLAND
SOUND
BROWNS LEDGE
DUMP SITE
NOMANS
LAND
NANTUCKET
71°00'
70°00'
NAUTICAL MILES
0 5 10 15 20
KILOMETERS
0 10 20 30 40

FIGURE 1